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Research Article

EVALUATION OF TRIFLUPROMAZINE-PROPOFOL AS AN ANAESTHETIC COMBINATION IN BUFFALO CALVES

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ABSTRACT

The study was undertaken in six clinically healthy male buffalo calves of 6 to 18 months of age and weighing between 120 to 206 kg, by administering triflupromazine (0.3 mg/kg b.wt., IM) followed by induction of anaesthesia with propofol (2.0 mg/kg b.wt., IV) after 15 min of triflupromazine administration. A decrease in spontaneous activity was seen after triflupromazine administration. Ataxia was observed at 3.33 min of triflupromazine administration. Swallowing reflex abolished at 3.83 min of propofol administration. Corneal and palpebral reflexes remained sluggish during anaesthesia. Response to needle pricks at base of tail was diminished but persisted at fetlock, ribs periosteum, abdomen and base of horn. Recovery was marked by the opening of eyelids and return of various reflexes. Complete recovery took 182.33 min. There was a significant increase in rectal temperature at recovery. A non-significant increase in heart rate was observed at 15 min of triflupromazine followed by a significant increase in heart rate at 5 min of propofol administration. There was a non-significant decrease in haemoglobin and a significant decrease in packed cell volume at recovery. Respiration rate decreased significantly after propofol administration. There was a non-significant hyperglycaemia, whereas, bilirubin level increased significantly after propofol administration.

Key words: Buffalo calves, propofol, triflupromazine

Triflupromazine hydrochloride is a potent behavior modifier possessing specific pharmacological properties. It's tranquilizing potency is 3-5 times that of chlorpromazine. It has been used as a preanaesthetic agent in ruminants (Kumar, 1993). Administration of triflupromazine leads to increase in heart rate and decrease in rectal temperature and respiration rate in buffaloes (Kumar and Singh, 1977). Propofol is an injectable anaesthetic drug characterized by rapid induction, satisfactory sleep, good haemodynamic stability, smooth recovery and lack of cumulative effect even after prolonged administration (Morgan and Legge, 1989; Weaver and Raptopoulos, 1990). Propofol has been reported to be safe for induction (1.0 mg/kg b.wt., IV as single dose) and maintenance (0.5 mg/kg b.wt. as 0.28% solution as constant infusion) of general anaesthesia in calves. The induction of anaesthesia and recovery has been reported to be smooth and quick (Genccelep *et al*., 2005). Its use has become increasingly popular as an intravenous anaesthetic agent both in animals and human beings primarily because of quality of induction and quick recovery from anaesthesia (Hall and Peshin, 1996). Ratnesh (2010) also reported that propofol is a safe intravenous agent to induce general anaesthesia in buffalo calves. The present study was undertaken with the objectives to evaluate efficacy of triflupromazine-propofol as an anaesthetic combination in buffalo calves.

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MATERIALS AND METHODS

The study was undertaken on six clinically healthy male buffalo calves (of 6 to 18 months of age and weighing 120-206 kg) using triflupromazine (Siquil – Triflupromazine hydrochloride 20 mg/ml, Zydus Animal Health Limited, Ahmedabad) @ 0.3 mg/kg b.wt., IM and propofol (Neorof™ - Propofol injection BP 1% w/v, Neon Laboratories Ltd., Andheri East, Mumbai) @ 2.0 mg/kg b.wt., IV. Various parameters tested were: Behavioural changes, rectal temperature, heart rate, respiration rate, haemoglobin (Hb), packed cell volume (PCV), plasma glucose, cholesterol, urea nitrogen, creatinine, total plasma proteins, albumin, sodium, potassium, chloride, alanine transaminase (ALT), aspartate transaminase (AST), alkaline phosphatase (ALKP) and bilirubin. Blood samples were collected from jugular

venipuncture; before the administration of triflupromazine, at 15 min of triflupromazine administration, at 5 min of administration of propofol, at recovery from the effect of the drug(s) and at 24 h of administration of triflupromazine. The statistical analysis of data was done by one-way-analysis of variance and Duncan's multiple range test (Duncan, 1955). Prior to the conduct of experiment, Institutional Animal Ethics Committee approval was obtained for this study.

RESULTS AND DISCUSSION

The effects of triflupromazine-propofol combination on behavioural parameters are shown in Table 1 and Figs. 1 and 2. A decrease in spontaneous activity was seen in all the animals, the animals were calm and quiet after the administration of triflupromazine. Ataxia was observed at 3.33 min after triflupromazine administration. Similar observation after triflupromazine administration was observed by Ninu (2009) in buffaloes undergoing diaphragmatic herniorrhaphy. Triflupromazine (0.3 mg/kg b.wt., IM) had been reported to be used as a preanaesthetic to ensure calming effect and smooth induction of anaesthesia in buffaloes undergoing diaphragmatic herniorrhaphy (Krishnamurthy *et al*., 1985). In this study, lacrimation was observed in one animal while salivation in drops was observed in four animals after triflupromazine administration which might be due to temporary para-sympathetic excitation

Table 1
Different behavioural characteristics in buffalo calves induced by the administration of triflupromazine propofol combination

Reflexes	Mean±SE (time in min)
Weak Time*	3.33±0.55
Eyes closed†	2.25±0.20
Limb relaxation†	2.83±0.40
Muzzle Dryness†	3.80±0.67
Loss of swallowing reflex†	3.83±0.79
Onset of salivation†	3.60±0.79
Ear flapping†	9.00±1.08
Eyes opens†	11.50±1.82
Regain of swallowing reflex†	15.50±2.45
Limb tone regain†	15.66±1.98
Regaining of Head righting reflex†	16.16± 2.82
Sternal recumbency†	22.83±3.12
Standing time†	25.33±3.32
Browsing time†	29.00±4.50
Complete recovery*	182.33±8.03

*after triflupromazine administration
†after propofol administration

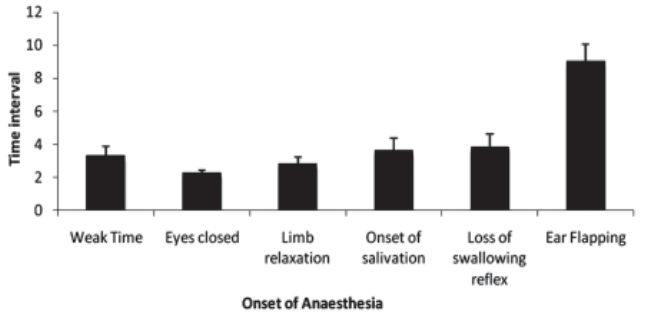

Fig 1. Onset of anaesthesia related to different time intervals of triflupromazine-propofol combination administration in buffalo calves.

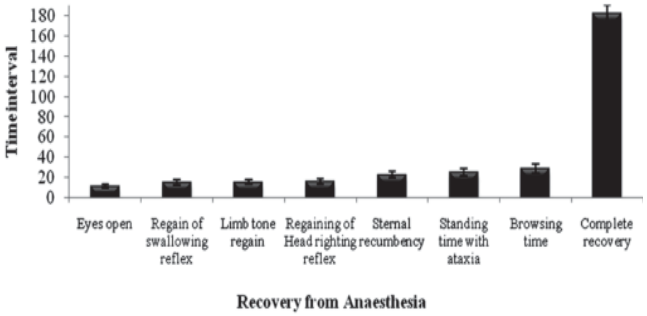

Fig 2. Recovery from anaesthesia related to different time intervals of triflupromazine-propofol combination administration in buffalo calves.

(Lakshmipathy and Vijayakumar, 1980). Propofol was administered 15 min after triflupromazine. Swallowing reflex abolished at 3.83 min of propofol administration. Corneal and palpebral reflexes remained sluggish throughout the period of anaesthesia. Similar findings were reported by Genccelep *et al.* (2005) in calves. It has been reported that rapid onset of action is caused by rapid uptake of propofol into the central nervous system (Zoran *et al.*, 1993). Muzzle and nostrils became dry in five animals at 3.80 min and copious salivation in five animals was observed at 3.60 min. of propofol administration. Grood *et al.* (1987) reported an increased salivation after propofol induction in human beings. Ventral rotation of eyeball was observed in three animals and in other three animals, eyeball remained in central position after propofol administration. The central position of the eyeball may be due to loss of the tone of the eye muscles and increased depth of anaesthesia (Hall *et al.*, 2001). Hall and Chamber (1987) in dogs and Genccelep *et al*. (2005) in cow calves observed downward rotation of the eyeball during anaesthesia with propofol.

There was complete relaxation of muscles of tail, anus, prepuce, limbs, jaw and tongue. Response to

needle pricks at base of tail was diminished but persisted at fetlock, ribs periosteum, abdomen and base of horn. This is because of the fact that phenothiazines have no analgesic property (Hall *et al.,* 2001) and very less analgesic property is exhibited by propofol (Tranquilli *et al.,* 2007). Propofol induces depression by enhancing the effect of the inhibitory neurotransmitter gamma-aminobutyric acid (GABA) and decreasing the brains' metabolic activity (Concas *et al.,* 1991). Five animals showed ear flapping at 9 min. 'Propofol shakes' (tonic-clonic movements) have been reported in dogs under propofol anaesthesia (Hall and Peshin, 1996). Recovery was manifested by regaining of swallowing reflex at 15.50 min and return of head righting reflex at 16.16 min after propofol administration. All the animals returned to sternal recumbency at 22.83 min. Animals stood up, although with ataxia, at 25.33 min of propofol administration. A little support was needed when the animals attempted to stand up. Animals started nibbling grass at 29.00 min. Complete recovery took 182.33 min after propofol administration. The short duration of action and rapid smooth emergence resulted from its rapid redistribution from the brain to other tissue and efficient elimination from plasma by metabolism (Zoran *et al.,* 1993).

The effects of triflupromazine-propofol combination on clinico-haematological parameters are shown in Table 2. There was a significant increase in rectal temperature at the time of recovery as compared to the base value. This might be due to depression of thermoregulatory center (hypothalamus) in brain and corresponding increase in ambient temperature. Reduced rectal temperature had been reported during propofol anaesthesia in goats (Carroll *et al*., 1998; Amarpal *et al*., 2002) and dogs (Ajadi *et al.,* 2007). A non-significant increase in heart rate was observed at 15 min of triflupromazine administration and after that heart rate further increased significantly at 5 min of propofol as compared to base value (Table 2). Heart rate remained higher than base value at the time of recovery, although it was statistically non-significant. This is in agreement with the findings of Ninu (2009) who also reported a non-significant increase in heart rate at 15 min of triflupromazine administration in buffaloes undergoing diaphragmatic herniorrhaphy. A significant increase in heart rate after propofol administration in cow and buffalo calves was observed by Genccelep *et al*. (2005), Kumar *et al.* (2011) and Potliya (2012). There was a significant decrease in respiration rate at 5 min of propofol administration as compared to base value. Propofol alone or with xylazine induced respiratory depression in dogs (Cullen and Reynoldson, 1993). The respiration rate decreased below the pre-induction level following propofol injection but, thereafter, it increased above the post-induction level (Adetunji *et al.,* 2002).

A non-significant decrease in Hb was observed at 5 min of propofol administration and at recovery in comparison to base value. The PCV decreased at 15 min of triflupromazine administration and remained low even at 24 h of triflupromazine administration, however, it decreased significantly at recovery as compared to base value. This decrease in Hb and PCV could be attributed to splenic pooling of blood constituents (Hewson *et al.,* 2006; Welberg *et al.,* 2006), shifting of fluids from extra vascular compartment to intravascular compartment to maintain normal cardiac output, and to alpha adrenolytic activity along with depression of the vasomotor centre caused by phenothiazines leading to splenic relaxation with consequent erythrocyte sequestration (MacKenzie and Snow, 1977; Muir *et al*., 1979). Ratnesh (2010) and Kumar *et al.* (2011) also observed non-significant variations in Hb and PCV in buffalo calves after propofol administration. However, Suresha *et al.* (2012)

Table 2
Changes in clinical and hematological parameters induced by the administration of triflupromazine-propofol combination in buffalo calves

Parameters (Units)	Before administration of triflupromazine	At 15 min of triflupromazine administration	At 5 min of propofol administration	At recovery	At 24 h of triflupromazine administration
Ambient temperature (^oC)	$28.75^{a}\pm0.63$	$30.67^{b}\pm0.49$	$31.25^{b}\pm0.40$	$33.83^{c}\pm0.60$	$30.75^{b}\pm0.70$
Rectal temperature (^oC)	$37.83^{a}\pm0.22$	$37.68^{ab}\pm0.26$	$37.25^{a}\pm0.21$	$38.08^{b}\pm0.17$	$37.31^{a}\pm0.23$
Heart rate (beats/min)	$48.67^{a}\pm6.19$	$53.67^{ab}\pm7.13$	$71.17^{b}\pm4.45$	$54.50^{ab}\pm4.20$	$47.17^{a}\pm6.64$
Respiration rate (breaths/min)	$17.00^{b}\pm1.71$	$17.83^{b}_{a}\pm2.04$	$12.83^{a}_{a}\pm0.40$	$20.67^{b}_{a}\pm1.20$	$17.50^{b}_{a}\pm0.88$
Haemoglobin (g/dl)	$11.76^{a}_{b}\pm0.65$	$11.50_{ab}\pm0.67$	$11.23_{ab}\pm0.72$	$11.33_{a}\pm0.58$	$11.53_{ab}\pm0.69$
Packed cell volume (%)	33.67 ±1.14	31.83 ±0.79	30.83 ±1.30	30.17 ±1.14	32.17 ±0.98

Means with different superscripts within a row for a parameter differ significantly ($p<0.05$)

Table 3
Blood biochemical parameters in buffalo calves before and after triflupromazine-propofol combination

Parameters (Units)	Before administration of triflupromazine	At 15 min of triflupromazine administration	At 5 min of propofol administration	At recovery	At 24 h of triflupromazine administration
Plasma glucose (mg/dl)	64.18^{a}±3.20	66.73^{a}±3.84	76.13^{a}±3.45	69.86^{a}±7.86	64.36^{a}±3.27
Cholesterol (mg/dl)	47.17^{a}±3.16	46.83^{a}±3.41	50.83^{a}±3.96	44.00^{a}±3.33	47.00^{a}±4.35
BUN (mg/dl)	10.34^{a}±1.92	10.39^{a}±1.79	10.19^{a}±1.76	11.19^{a}±1.78	11.94^{a}±2.31
Creatinine (mg/dl)	2.02^{a}±0.31	1.92^{a}±0.20	2.41^{a}±0.69	1.91^{a}±0.23	1.91^{a}±0.26
Total proteins (g/dl)	7.07^{a}±0.85	6.83^{a}±0.79	7.36^{a}±0.78	6.61^{a}±0.75	7.20^{a}±0.89
Albumin (g/dl)	3.02^{a}±0.26	2.98^{a}±0.24	3.17^{a}±0.23	2.95^{a}±0.23	3.15^{a}±0.25
Globulin (g/dl)	4.05^{a}±0.60	3.84^{a}±0.56	4.18^{a}±0.56	3.65^{a}±0.53	4.05^{a}±0.65
Albumin:globulin ratio	0.77^{a}±0.05	0.81^{a}±0.05	0.78^{a}±0.05	0.85^{a}±0.07	0.82±0.07
Sodium (mmol/L)	126.89^{a}±1.59	128.06^{a}±1.36	129.34^{a}±1.24	128.98^{a}±1.39	127.75^{a}±1.65
Potassium (mmol/L)	5.23^{a}±0.17	5.06^{a}±0.23	5.01^{a}±0.19	5.03^{a}±0.26	5.23^{a}±0.18
Chloride (mEq/L)	78.40^{a}±4.47	80.18^{a}±3.62	86.26^{a}±3.32	81.34^{a}±3.92	81.54^{a}±3.57
ALT (IU/L)	51.81^{a}±5.76	59.56^{a}±10.73	62.03^{a}±11.89	54.40^{a}±9.99	53.60^{a}±10.54
AST (IU/L)	134.48^{a}±12.05	144.60^{a}±18.68	154.11^{a}±18.58	146.60^{a}±19.80	156.06^{a}±22.01
ALKP (IU/L)	145.17^{a}±22.81	151.50^{a}±20.12	152.83^{a}±23.49	141.50^{a}±18.58	148.83^{a}±21.17
Bilirubin (mg/dl)	0.89^{ab}±0.10	0.99^{ab}±0.07	1.28^{b}±0.20	0.81^{a}±0.11	0.73^{a} ±0.13

Means with different superscripts vary significantly ($p<0.05$)
BUN=Blood urea nitrogen; ALT=Alanine transaminase; AST=Aspartate transaminase; ALKP=Alkaline phosphatase

observed significant fall in Hb and PCV after triflupromazine and propofol administration in dogs.

The effects of triflupromazine-propofol combination on certain biochemical parameters are shown in Table 3. Plasma glucose showed a non-significant increase at 5 min of propofol administration in comparison to base value. Ratnesh (2010) also observed a significant increase while Kumar *et al.* (2011) observed a non-significant increase in glucose level after propofol anaesthesia in buffalo calves. A significant hyperglycaemia has also been reported during propofol administration in dogs (Venugopal *et al*., 2002; Khan *et al*., 2006) and in calves (Potliya, 2012). Increased glucose is probably an indication of stress. Hyperglycaemia observed in the present study might be attributed to an $alpha_2$-adrenergic inhibition of insulin release from beta pancreatic cells and to an increased production of glucose via $alpha_1$-adrenoceptors in liver (Brockman, 1981). Moreover, during the period of anaesthesia, there is decrease in basal metabolic rate of the animal and muscular activity is negligible, so utilization of glucose by muscles is also decreased probably causing slight increase in glucose concentration. However, since hyperglycaemia produced was transient in nature and within the normal physiological limit, therefore a clinical significance cannot be fixed. A significant increase in bilirubin level was observed at 5 min of propofol administration as compared to base value. Total bilirubin level in blood is an indicator of liver function as well as erythrocyte status of the body. The increased levels might be because of increased production (as in haemolysis), decreased clearance, inadequate conjugation, or impaired biliary excretion (Rothuizen, 2000; Kaneko *et al*., 2008). Ratnesh (2010) and Potliya (2012) observed a non-significant variation in bilirubin level in buffalo calves after propofol administration. No significant variations were seen in other biochemical parameters. From the present study, it can be concluded that triflupromazine-propofol anaesthetic combinations may safely be used for short duration surgery in buffaloes.

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